burning in its relation to stock-diseases. Veld changes resulting from burning may so alter the whole ration-selections of the grazing animals that they may commence browsing on widely differing plants, formerly avoided, and often of an inimical character.

In Section D, Dr. Annie Porter read a paper on the occurrence of leuctogregarines in South Africa; two such occurrences—one in a dog and one in a rabbit—had been observed. Prof. Fantham recorded the presence of various parasitic protozoa in South African fishes and amphibians; and Dr. F. G. Cawston gave an account of the cercariæ which attack South African snails.

The Rev. H. A. Junod described before Section E the customs of the Baronga in relation to smallpox. They had practised inoculation with the virus for many decades, using the serous fluid invariably from children or from old people, *i.e.* from those who might be called asexuate. The Hon. Mr. Justice Jackson read a paper on the medicine-man in Natal and Zululand. Unqualified men are allowed to practise on payment of a fee, and more than 1400 of these men have taken out licences. Dr. J. B. McCord also contributed a paper on Zulu witch-doctors and medicine-men, and described some startling surgical operations performed by these with no better instrument than a piece of broken glass. The Rev. J. R. L. Kingon spoke on unrealised factors in economic native development. He showed what profound changes had come about as a direct result of the use of certain implements, both of peace and war: the poisoned arrow and the assegai, the plough and the wagon, the primitive sledge contrasted with the railway, had each in turn exercised important effects in tribal life, and an axe had been the cause of a war. Mr. J. D. Marwick dealt with the important subject of the natives in the large towns. He uttered a warning regarding the growing tendency of the younger natives to form bands for the practice of crime and vice. Dr. C. T. Loram offered some practical suggestions for better provision for the medical needs of the natives; and two very interesting contributions were made by Mr. J. McLaren, one on Xosa arts and crafts, and the other on Xosa religious beliefs and superstitions. Of absorbing and unique interest was an account given by Dr. C. Pyper of the engraved (cup- and ring-marked) stones of the Lydenburg district in the North-Eastern Transvaal. Mr. W. Hammond Tooke discussed the problem of the Rhodesian ruins, and entered the lists against the views expressed on a former occasion by the Rev. S. S. Dornan. The latter gentleman also contributed a paper on the killing of the divine king in South Africa; the practice is founded on the belief that the potentate, in order to retain his divinity, must die a violent death as soon as senile decay sets in, lest the divine spirit should likewise suffer decay.

Before Section F, Mr. R. T. A. Innes initiated a discussion on the desirability of giving direct representation in the Upper House of the Union Legislature to education, agriculture, manufacture, mining, law, health, commerce, and finance. Purpose in education was discussed by Mr. H. C. Reeve; its ultimate aim should approximate towards the definite ideal of happiness for all The demand for vocational training, so insistent of late, consequent on over-emphasising production, has revealed a lack of clear thinking, and the first need is, therefore, for leaders of thought to acquire definite views regarding education's ultimate aim.

On the first evening of the session, after the conclusion of the president's address in the Selborne Hall (see NATURE of September 19), Dr. Juritz presented to Mr. R. T. A. Innes, Union Astronomer, a cheque for 50*l*. and the South Africa medal annually awarded in recognition of achievement and promise in connection with scientific research in South Africa.

The 1919 session of the association will be held at Kingwilliamstown, with the Rev. Dr. W. Flint as president.

REPORT OF THE SURVEY OF INDIA.

THE report issued by Col. Sir S. G. Burrard, the Surveyor-General of India, for the year 1916–17 includes a most satisfactory record of work accomplished in spite of a depleted staff and the difficulties involved by war exigencies. It is gratifying to observe how this Department has responded to the call of the war; the list of honours awarded to its members for distinguished service in the field is one of which any department might well be proud. Survey detachments have been sent to Mesopotamia, Western Persia (with the Russian forces), Persia (generally), Salonika, Waziristan (with the Field Force), and to the Makran border mission. Not a word is said about the work accomplished by these military parties, but quite enough is known, independently of the report, to justify the statement that they have well maintained the reputation of Indian surveyors in the field of military action. We shall hear all about them in time, though probably not from India. The normal work of the Department has been well sustained, especially in the topographical branches, where good progress towards the completion of the 1915 scheme is recorded. Broadly, this scheme embraced a re-survey of India (of which the topography was then nearly complete, but much out of date) on the scale of 1 in. per mile, with a subsequent very wise reservation in favour of ½ in. per mile for certain extensive but unimportant areas of wilderness and jungle. The whole output for the year amounts to about 33,000 square miles (still leaving 1,350,000 to be completed) at an approximate cost of 31.4 rupees per square mile (say 2*l*.). Certain small areas of forest on scales of 3 in. and 4 in. per mile are included, so that this output of the twelve small parties employed must be considered very satisfactory. The geodetic operations include (besides direct triangulation and the magnetic surveys) pendulum, tidal, and levelling observations of great scientific value. More than one million maps have been turned out in the map department, including topographical, geographical, and general maps, amongst which are twelve sheets of the "one millionth" map of the world, which are now reduced to uniform style so as to take their place with similar sheets of the series published by the Royal Geographical Society and elsewhere. The colour system adopted by the Survey of India for defining differential altitudes in planes of different tints is not beyond criticism. The highest altitudes (next the regions of perpetual snow) are coloured a blood-red. The result when applied to Tibet is almost comic in its blazing determination to secure due recognition for the "Roof of the World." T. H. H.

PHYSICS IN RELATION TO NATIONAL LIFE.[1]

ABOUT one hundred years ago—in the year 1808—Dr. Thomas Young, one of the greatest of English physicists, published his "Lectures on Natural Philosophy." They had been delivered a short time previously at the Royal Institution, and are a storehouse of physical science as it was then known. In his introduction he says:—"The dissemination of the knowledge of natural philosophy and chemistry becomes a very essential part of the design of the Royal Institution, and this department must in the natural order and arrangement be anterior to the application of the sciences to practical uses ·To exclude all knowledge but that which has already been applied to immediate utility would be to reduce our faculties to a state of servitude and to frustrate the very purposes which we are labouring to accomplish. No discovery, however remote in its nature from the subjects of daily observation, can with reason be declared wholly inapplicable to the benefits of mankind."

---

[1] From a lecture delivered on April 27 by Sir Richard Glazebrook, C.B., F.R.S., in a course on "Science and the Nation," arranged for science teachers by the London County Council Education Committee.

The lectures cover the whole range of physics as it was then known, and in the last, the sixtieth, the author concludes:—"When we reflect on the state of the sciences in general at the beginning of the seventeenth century and compare it with the progress which has been made since then in all of them, we shall be convinced that the last two hundred years have done much more for the promotion of knowledge than the two thousand which preceded them, and we shall be still more encouraged by the consideration that perhaps the greater part of these acquisitions have been made within fifty or sixty years only. We have, therefore, the satisfaction of viewing the knowledge of Nature, not only in a state of advancement, but even advancing with increasing rapidity."

Dr. Young lived one hundred years ago, and if then these words were true, how much more true are they to-day! The rate of growth of our knowledge of inanimate Nature in the past twenty years or so has far surpassed anything he ever contemplated, and the benefits that growth has brought mankind far exceed all he ever dreamed of. Not that they are all benefits; the terrors of war, the sufferings of the innocent, the poison-gas shell, the bomb that kills women and children, and the nameless horrors Science has put it into the power of human fiends to deal around forbid that comforting dream.

Still, there is no doubt which way the balance turns. Contemplate modern life without physics—the science of energy; think of it with our knowledge of electricity, what it was even when Young wrote, with the steam-engine almost a toy, with ships dependent still upon the wind and tides, with the engineer compelled to use human labour, assisted only by the simpler mechanical devices, such as the inclined plane or some elementary arrangement of pulleys for his buildings and bridges.

Physics guides us in directing the national stores of energy into channels useful to man; it is to this power that man owes his supremacy over the brute creation, and it is to the discovery of those natural laws which are the subject of study of the physicist that this power is due. This statement of our subject is sufficient to indicate its extent. Clearly, to treat in turn of all its branches and indicate their connection with our national life is a hopeless task for an hour's lecture. There is not time to deal completely even with one, and yet I think some appreciation of what we owe to physical science may be gained if I attempt a very brief review of our knowledge of electricity one hundred years ago and of its progress since that date.

The age was a fertile one. Cavendish was still working, and had discovered many of the laws of statical electricity; he had shown how to combine oxygen and hydrogen to form water, and had used the electric arc to produce nitrogen from the air.

On the Continent Coulomb had verified experimentally the inverse square law for electricity by the use of the torsion balance, and had investigated its distribution on conductors of various forms. Laplace and Poisson were active in applying mathematical calculations to problems in electrostatics, and somewhat later (1828) George Green, the self-taught mathematician—he was a Nottingham shoemaker who, after the publication of the paper referred to, entered at Caius College, Cambridge, became fourth Wrangler in 1837, and died in 1841—made by far the most important advance up to that date in electrical theory. The Leyden jar had long been invented, and some experiments had been made on currents produced by discharging a series of condensers (Leyden jars) through long wires or obtained through statical electrical machines; little was known of the properties of the current, because no means of producing continuous currents existed.

The science of magnetism was in a similar elementary condition. Gilbert, of Colchester, physician to Queen Elizabeth, in his treatise "De Magnete," published in 1600, had described the fundamental facts of the subject, and Coulomb had applied the torsion balance to prove the inverse square law for magnetism; there was a vague idea that there must be some connection between electricity and magnetism, but of electro-magnetism and all the vast possibilities it implied there was no conception. With the new century came a change, though even then progress, which to Young, writing in 1808, seemed rapid, to us seems slow.

In 1800 Volta invented the voltaic pile, a pile of discs of zinc and copper, alternately separated by flannel washers moistened with dilute acid; a considerable e.m.f., depending, of course, on the number of couples, is produced between the extreme discs, and a small current can be drawn from the apparatus. Then came his "crown of cups," the primitive form of battery, a plate of zinc and copper dipping into a vessel (a cup) filled with dilute acid, and connected by a wire outside the vessel; a number of these arranged in series formed the crown.

Twenty years later (in 1820) came Oersted's great discovery, described in his "Experimenta arca effectum conflictus electrici in acum magneticum," in which he described for the first time the action of a current on a magnet; the ordinary method of measuring a current by the deflection of a magnet was a natural result, and Schweigger invented the galvanometer, while Ampère with wonderful rapidity established elementary laws which regulate the action of one current on another, and laid the foundation of electro-dynamics. In the same year Arago, followed in 1821 by Sir Humphry Davy, discovered independently the power of a current to magnetise steel. Arago's further discovery in 1824 of the rotation of a magnet when suspended freely over a rotating copper disc led ultimately to results of the very greatest importance, which culminated in 1831 in Faraday's discovery of the induction of electric currents and the elucidation of their laws.

The child was born whose birth was soon to be of such immense consequences to mankind, but probably no one, not even Faraday himself, realised all that was to follow.

In 1827 Ohm stated the law now universally known by his name, and its statement led to much important work with a view to its complete verification. The fundamental laws of electrolysis were enunciated by Faraday in 1833, and for long there was an ardent controversy as to the source of the electromotive force in a galvanic cell.

By the middle of the century the foundations of the science were well and truly laid; its influence on national life had until then been but small, but the ground was secured on which to build safely the structure of the practical applications of electricity. In the last seventy years theory has advanced no less than practice; indeed, as we shall see later, some of the most important recent practical advances are the outcome of very recent theory; but the fact remains that for real progress the practical application of a science must rest upon a secure basis of theory; only then will its progress be rapid and uninterrupted.

Ampère's experiments and Faraday's researches had indicated various methods by which motion could be produced owing to electro-magnetic action, or conversely, by which currents could be generated in conductors moving in magnetic fields, and as a result numerous inventors produced magneto machines. Faraday himself used one made by Pixie. In Saxton's machine, employed frequently towards the middle of last century, two coils wound round a soft iron armature rotate in front of the poles of a strong permanent magnet somewhat as is done in the spark magneto of the present day.

Werner Siemens in 1857 invented the Siemens armature; the next step was to replace the permanent magnets by electromagnets excited by a separate small machine. Wilde's machine (1867) was of this class, and in the same year Wheatstone and Werner Siemens enunciated the principle of the modern self-exciting dynamo, in which the remanent magnetism of the field coils is utilised to start a feeble current in the rotating armature; this current is led round the field coils, thus reinforcing their magnetism, and in this manner the powerful currents generated by modern machines are built up.

So far, the fundamental principles established by Faraday had been the basis of the work done. Various distinguished men contributed to advance the theory and to improve practice. About this time the Electrical Standards Committee of the British Association began its labours. Appointed at the instance of Lord Kelvin (Sir William Thomson) in 1861, during the period 1862–70 it made a series of reports which have been of fundamental importance in the theory and practice of electricity. It was re-appointed in 1881 at the suggestion of Prof. Ayrton, and continued to do useful work until 1913, when it was felt that the National Physical Laboratory was carrying out the duties for which it had been organised.

Lord Kelvin, in his work connected with the Atlantic telegraph, had realised very fully the need for a consistent system of units of measurement. Such a system had been proposed by Weber, and the committee in the end was led to adopt as fundamental the C.G.S. (centimetre-gram-second) system of units, and base on it the practical system of electric units—the ohm, the ampere, and the volt—now in use everywhere. It is impossible to overestimate the practical effects of this action. In the first place, electricians throughout the world speak a common language, and the results of researches are intelligible to all alike; in the second, that language is a consistent and logical one, electrical quantities are connected together and linked with the fundamental conception of energy in the simplest manner possible, and in a way which permits of accurate numerical calculation.

As a result of the labours of the distinguished men who formed the committee and their colleagues at home and abroad, we had the means of measuring with high accuracy current, electromotive force, and resistance, together with a number of other dependent electrical quantities.

Another step was needed to complete the theory of the dynamo: to permit the manufacturer to design on scientific principles a machine which for a given speed of rotation would transform mechanical into electrical energy at any required rate in the form of a given current at a known voltage.

The laws of magnetic induction in iron and steel were known but very imperfectly. As has already been stated, Arago and Davy had discovered in 1820 that iron was magnetised by a current; Poisson and others had given theories of this induced magnetism; Kelvin in his earlier papers had done much to clear up ambiguities and to give definiteness to the terms used. Rowland, in America, carried out numerous experiments of great value, but it is to Ewing and Hopkinson that we owe our first real knowledge of the importance of the magnetisation curve, the meaning of the property known as hysteresis, which had a short time previously been investigated by Warbury, and the part this plays in the action of electrical machinery.

The experiments of Oersted and Ampère had taught us that an electric current circulating in a coil of wire produces a field of magnetic force linked with that coil, and, as Faraday proved, the inductive effects produced in any neighbouring circuit depend on the manner in which that circuit is also linked with the magnetic lines.

John Hopkinson in 1879 had shown how the properties of a dynamo could be deduced from its characteristic curve, the curve connecting the e.m.f. in the armature with the exciting current in the field coils; and in a joint paper with his brother Edward, read before the Royal Society in 1886, he described how the form of this curve could be obtained graphically for a dynamo of known design and dimensions from the ordinary laws of electro-magnetism and the known properties of iron which Ewing had shown how to determine. The theory of the dynamo was complete in its main outlines. Since then progress has been rapid. Theory has indicated the direction in which improvements were to be sought; the skill of the metallurgist, the engineer, and the designer has been called in to put those improvements into practice.

The result you know. Conceive the world without electric power—London without its tubes and railways, its electric light, telephones, telegraphs, and wireless services—and you will realise to some degree what is due to the labours of the physicists under whose skilled guidance all this system has grown up in the last twenty-five or thirty years out of the small seed sown by Faraday and his contemporaries.

It is not easy to obtain figures which give with accuracy the extent to which electrical power is used at present. In the Electrical Trades Directory for 1917 it is stated that more than 500,000,000*l.* has already been sunk in the industry, and there is every prospect of that sum being largely increased.

I have endeavoured to indicate in brief outline the process by which this stupendous result has been achieved. In the first place, we have the disinterested labours of the man of science impelled by the desire to know; then have followed the mathematician and the physicist, whose work has reduced the early observations of the experimenter to the rule of law, and when that law has been established it has become possible for the electrical engineer to grasp the problem and apply the teaching of the physicist to the needs of national life.

Illustrations of the process, proofs of the debt due to physics, could be taken from many other branches of science did time permit. The development of the steam-engine did not at first depend to any large extent on exact measurement and physical research. Progress was comparatively slow until Rankin and Kelvin developed the thermodynamics of steam—work continued in our own time by many well-known names, and turned to practical use of the highest importance by Parsons in the development of the turbine.

When the story of the past four eventful years can be fully written, the nation will realise to an extent it has never done before the importance of physics to our national life. What conclusions can we who do realise this draw from the facts I have imperfectly put forward? What lessons are there for the time that is to come, that reconstruction period, which, if rightly used, will mean so much to England? We must, to begin with, give the man of science a freer hand, a better chance to develop his discoveries; and, in the second, with this object we must educate the people to appreciate more fully the importance of science.

Men who can make great discoveries are few in number; increase the opportunities for their work when found, and encourage all that may help to develop them. Such a man may come from any rank of life. Mr. Seaton, in an interesting paper on the importance of research in marine engineering read recently before the Institution of Naval Architects, in directing attention to the fact that many inventions of importance to engineers have been made by men who were not engineers, writes thus:—"Bramah, one of the first to suggest the screw-propeller, was a blacksmith and locksmith; George Stephenson a fireman; "Screw-propeller" Smith, who patented a good workable propeller, was a farmer. . . . The inventor who exhibited an internal-combustion engine at Cambridge a hundred years ago was a parson; so also was Ramus, the inventor of the hydroplane ship. James Watt was an optical-instrument maker; the inventor of the chronometer was a gardener. "Increasing-pitch" Woodcroft was a librarian, Bessemer an artist, Armstrong a lawyer."

Though in these days of increasing specialisation the task of the amateur discoverer grows daily more severe, the importance, in the first place, of the educational ladder to give any boy of real talents his chance, and, in the second, of providing for the man who has proved he can advance knowledge and may make a real discovery, is paramount. No doubt the chances of success are small. Many will set foot on the ladder and climb to a greater or less height, but few will reach the top. No doubt also the selection of those who should be encouraged is difficult; examination success is by no means always the surest test, yet it is not easy to frame another. But then the discoveries of the men of science are rarely in a form to be assimilated directly by industry and to become available for the national advantage. It was a long step from Faraday's researches to the dynamo and motor of to-day; or from the Faraday dark space and Hittorf's experiments with cathode rays, and Röntgen's discovery of the X-rays, to the Coolidge tube and the X-ray outfit of the modern Army hospital; or, again, from Kelvin's paper on electrical oscillations in 1855, or Helmholtz's first suggestion of the same in 1847, to the modern developments of wireless telegraphy.

What action can we take to bridge the gulf, to render scientific discovery more readily available and to spread more widely knowledge which may be of the utmost service to the manufacturer? This I take to be the work of laboratories of industrial research, which I hope to see grow up in the various great centres of industry. In such a laboratory the staff are studying continuously to bring scientific knowledge as it advances to bear on industrial problems. They must be skilled experimenters with a sound knowledge of recent discoveries, a real zeal for the work they have undertaken, and a deep-seated belief in its importance to the nation. The laboratory must be equipped in a complete manner with plant and apparatus such as would be found in works, prepared to carry out the investigations necessary before a new process or idea, the outcome of some laboratory investigation, can be applied on a works scale.

For such work special laboratories and conditions are essential. The National Physical Laboratory should be one such; in time, a central institution for this task, correlating the work of the various local institutions, carrying out work which might be common to a number, and serving as a centre from which information is disseminated, and to which manufacturers will come for suggestions and guidance.

All this, however, will be of little avail unless the nation as a whole learns to appreciate its importance. What is to be done to evoke a more intelligent interest in physics among men at large; to induce our legislators to realise the necessity for large expenditure and generous support; to evoke a general faith in the efficacy of scientific method which would go so far to hearten and encourage the patient worker?

I am speaking mainly to teachers; let me, in conclusion, address a few words to you specially as such. If I have convinced you of the importance of my subject—many needed no convincing, I am sure—may I remind you that it is your great task to arouse this faith; to lead the rising generation to look on physical science, not as something outside and apart from their daily life, but as a source of strength and progress; to educate them so that they may realise more fully what they owe to the great men of the past who have sowed the seeds of England's power, and what they must do to preserve the heritage these men have handed down to them?

But how? The question is a difficult one to answer. There is a loud call for a more generous recognition of science in our schools, for curricula in which it has a larger share in the time-table, for more recognition for its teachers and more prizes and scholarships for its students. While this is most desirable, it is not enough; alone it will do little. Lord Bryce in a recent article writes:—"No man can be deemed educated who has not some knowledge of the relation of the sciences to one another and a just conception of the methods by which they respectively advance." Will the student gain this education merely by transferring him for so many hours a week from the literary side to the scientific side of the school? I fear not. Reform is needed in our methods of science teaching. I speak as one responsible in part for those methods with a consciousness of some fault. Forty years ago it was my privilege to organise, along with my colleague, Sir Napier Shaw, the teaching of practical physics at the Cavendish Laboratory. We were dealing, under difficulties, with young university students preparing to take a degree in science or medicine, men proposing to specialise. We had learnt the necessity for exact measurement in all research, the importance of a personal acquaintance with the methods by which our knowledge had been advanced; we were not then concerned with the general education of the vast mass of boys and girls throughout the country, and so we devised and extended the methods of practical physics. We made each student verify Ohm's law, measure the specific capacity for heat of copper, or the wave-length of sodium light; and that method, devised for a special purpose for which I still think it the most useful, lent itself to the examiner and the teacher as a method by which the mass of pupils could be instructed and examined. It has been extended and developed by many able and enthusiastic men; too often it is elaborated so far as to be little more than press the button and note what happens. You have then proved that the pressure of a gas at constant volume is proportional to its temperature.

In the case of the ordinary boy and girl the results have little more influence on their lives than the lists of the kings of Israel or the emperors of Rome, or the exceptions to some abstruse rule of grammar. They have been forced to learn by heart in order to train their memory. Sir Napier Shaw has recently written thus:—"When we come to consider such provision as there is for science in general education as represented by the opportunities actually offered to boys and girls at school, it is for me impossible to avoid the conclusion that what the exponents of physical science have evolved as the elements of scientific education is quite unworthy of the subjects we wish to expound."

If this be so, how then are we to remedy it? The question is one too difficult to answer at the end of a long lecture. I think a remedy is possible. The teacher ought, I feel sure, to be able to arouse an interest in the principles of his subject without a wearisome attention to details; to give to a class the general idea of what is involved in the ordinary laws of Nature; of what we mean by energy or momentum, the conservation of energy or the mechanical equivalent of heat; of the connection between electricity and magnetism and the historical development of the various laws about which he has been speaking—in fine, to give the pupil some knowledge of the relation of the sciences to one another and a just conception of the means by which they advance.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

A conference on women in industry will be held under the auspices of the Industrial Reconstruction Council on Tuesday, October 22, at 6 p.m., in the hall of the Institute of Journalists, 2 and 4 Tudor Street, E.C.4. The subject will be introduced by Miss Lilian Dawson, after which the discussion will be open. No tickets are necessary.

A course of three public lectures on "France's Share in the Progress of Science" will be delivered at University College on Tuesdays, October 22 and 29 and November 5, at 5 p.m., by M. Henri L. Joly, professeur de sciences physiques et naturelles au Lycee Français (Institut Français du Royaume Uni). The chair will be taken at the first lecture by Prof. J. Norman Collie. A leaflet containing a full syllabus of the lectures may be obtained by sending a stamped addressed envelope to the Publications Secretary, University College, London (Gower Street, W.C.1)

The Armstrong College (Newcastle-upon-Tyne) calendar will not be published for the current session, but the prospectus of day classes, a copy of which has reached us, contains the essential particulars respecting the courses of work in pure and applied science which have been arranged for the academic year 1918–19. Students of pure or technical science in the college may proceed to the degrees in science of the University of Durham, of which the college is a part, and, according to the number of years of study, may present themselves for graduation as bachelor, master, or doctor of science, or as doctor of philosophy. For the degrees of master and doctor great importance is attached to success in research. We have received also the current calendar of the Royal (Dick) Veterinary College, Edinburgh, which was founded in 1823 by the late Prof. Dick, and endowed by him, his sister, and Mr. A. I. MacCullum. The college prepares its students for the diploma of membership of the Royal College of Veterinary Surgeons and degrees in veterinary science in the University of Edinburgh, and also offers facilities for post-graduate work.

SOCIETIES AND ACADEMIES.

Melbourne.

Royal Society of Victoria, July 11.—Mr. J. A. Kershaw, president, in the chair.—C. **Fenner**: The physiography of the Werribee River.—Prof. T. H. **Laby** and E. O. **Hercus**: The thermo-conductivity of air.

Sydney.

Linnean Society of New South Wales, March 27.—Prof. H. G. Chapman, president, in the chair.—Dr. A. B. **Walkom**: The geology of the Lower Mesozoic rocks of Queensland, with special reference to their distribution and fossil flora, and their correlation with the Lower Mesozoic rocks of other parts of Australia. The Lower Mesozoic rocks of Queensland comprise three divisions—the Ipswich, Bundamba, and Walloon series. The Ipswich and Bundamba series are of comparatively limited distribution, and are confined to the south-eastern portion of the State. The Walloon series has a much greater extent; in addition to occurring in south-eastern Queensland, in association with the Ipswich and Bundamba series, it outcrops in a belt along the western slope of the Main Divide from the New South Wales border to Cape York, dipping westerly beneath the marine Cretaceous. It probably underlies the Cretaceous strata over the greater part of western Queensland. In eastern Queensland there are a number of small isolated occurrences of the Walloon series. The thicknesses of the three series are, approximately: Ipswich series, 2000–2500 ft.; Bundamba series, 3000–5000 ft.; and Walloon series, up to 10,000 ft. A comparison of the Queensland Lower Mesozoic strata with other occurrences in Australia of similar age seems to show (1) that the Narrabeen and Hawkesbury Sandstone stages in New South Wales are older than the Ipswich series; (2) that the Wianamatta stage of the Hawkesbury series in New South Wales, and also possibly part of the Lower Mesozoic strata of Tasmania, are of the same age as the Ipswich series; and (3) that the following series in the other States are of the same age as the Walloon series: The Artesian series, Clarence series, and Talbragar beds in New South Wales; the Jurassic strata of the South Gippsland, Cape Otway, and Wannon areas of Victoria; the Leigh's Creek beds in South Australia; part of the Lower Mesozoic strata of Tasmania, and the marine Jurassic series in Western Australia.—Dr. R. J. **Tillyard**: (1) Studies in Australian Neuroptera. No. 5: The structure of the cubitus in the wings of Myrmeleontidæ. An examination of the pupal tracheation of the fore-wing of *Xantholeon helmsi*,